

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

5 1. A process for converting a liquid feed material into a vapor phase product comprising the following steps:

10 (a) providing a fluid bed comprising solid particles and a fluidizing medium, wherein the fluidizing medium is moving in a substantially vertical fluidizing direction and wherein the solid particles are at a conversion temperature which is suitable for facilitating the conversion of the liquid feed material to the vapor phase product;

15 (b) moving the solid particles in a substantially horizontal solid transport direction from an upstream horizontal position to a downstream horizontal position;

20 (c) introducing the liquid feed material to the fluid bed at a feed zone located between the upstream horizontal position and the downstream horizontal position in order to facilitate the conversion of the liquid feed material into the vapor phase product; and

(d) collecting the vapor phase product.

25 2. The process as claimed in claim 1, further comprising the step of collecting the solid particles.

30 3. The process as claimed in claim 2 wherein the step of providing the fluid bed is comprised of introducing the solid particles at the upstream horizontal position and wherein the step of collecting the solid particles is comprised of collecting the solid particles at the downstream horizontal position.

4. The process as claimed in claim 3, further comprising the step of regenerating the solid particles for re-use after collecting the solid particles.

5. The process as claimed in claim 4 wherein the step of regenerating the solid particles is comprised of heating the solid particles.

6. The process as claimed in claim 5 wherein the step of regenerating the solid particles is comprised of heating the solid particles to the conversion temperature.

7. The process as claimed in claim 1 wherein the step of moving the solid particles in the substantially horizontal solid transport direction consists essentially of moving the solid particles under the influence of gravity.

10 8. The process as claimed in claim 7 wherein the upstream horizontal position is at a higher elevation than the downstream horizontal position so that the solid particles move in the solid transport direction from the upstream horizontal position to the downstream horizontal position under the influence of gravity.

15 9. The process as claimed in claim 1 wherein the step of providing the fluid bed is comprised of introducing the fluidizing medium at a lower vertical position below the solid particles so that the fluidizing direction is substantially upward.

20 10. The process as claimed in claim 1 wherein the step of introducing the liquid feed material to the fluid bed at the feed zone is comprised of spraying the liquid feed material so that the liquid feed material contacts the solid particles as droplets.

25 11. The process as claimed in claim 10 wherein the liquid feed material is sprayed within the fluid bed so that the droplets penetrate the fluid bed.

12. The process as claimed in claim 10 wherein the liquid feed material is sprayed so that the droplets contact the solid particles from a spraying direction which is substantially perpendicular to the solid transport direction.

30 13. The process as claimed in claim 10 wherein the spraying direction is a substantially vertical direction.

14. The process as claimed in claim 13 wherein the spraying direction is substantially opposite to the fluidizing direction.

15. The process as claimed in claim 1, further comprising the step of quenching the vapor phase product after collecting the vapor phase product in order to minimize further conversion of the vapor phase product.

16. The process as claimed in claim 1, further comprising the step of collecting the fluidizing medium with the vapor phase product at an upper vertical position above the solid particles.

17. The process as claimed in claim 16, further comprising the step of separating the fluidizing medium and the vapor phase product after collecting the fluidizing medium and the vapor phase product.

15 18. The process as claimed in claim 1 wherein the solid particles are moved in the solid transport direction at a rate which is significantly larger than a rate of mixing of the solid particles in the solid transport direction.

20 19. The process as claimed in claim 1 wherein the liquid feed material is comprised of liquid hydrocarbon.

20. The process as claimed in claim 1 wherein the liquid feed material is comprised of a heavy hydrocarbon.

25 21. The process as claimed in claim 1 wherein the liquid feed material is comprised of heavy oil or a heavy fraction of a crude oil.

10 22. The process as claimed in claim 1 wherein the solid particles are comprised of an amount of a catalyst which is suitable for use in converting the liquid feed material into the vapor phase product.

23. The process as claimed in claim 1 wherein the step of collecting the vapor phase product is comprised of collecting the vapor phase product at a plurality of vapor phase product

collection locations spaced horizontally between the upstream horizontal position and the downstream horizontal position.

24. The process as claimed in claim 23 wherein the vapor phase product has a
5 composition and wherein the composition of the vapor phase product varies amongst the vapor phase product collection locations.

25. The process as claimed in claim 1, further comprising the step of collecting a
10 vaporized fraction of the liquid feed material at a vapor phase product collection location which is adjacent to the feed zone.